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ABSTRACT

Articles in this double issue of a journal concerned with education and science cover a range of topics with a particular focus on the environment. They include: (1) a profile of Jens Reich, a scientist with interests in the economy and society; (2) a report on an upcoming education summit to decide on reform in university studies; (3) four contributions that discuss German efforts to infuse environmental education into the school curriculum; (4) a "Viewpoint" article by Ernst Ulrich von Weizsacker on the global environment crisis and the tasks of higher education and science in the 21st century; (5) three contributions on educational policy consisting respectively of a discussion on opportunities for young foreigners in German schools and professions, a vocational training report identifying a lack of skilled workers, and an article on the promotion of gifted persons in the Federal Republic of Germany; (6) a report on the intensification of industrial research in the former East Germany; and (7) two contributions in the area of international cooperation, one concerning Arctic research with Russia and the other concerning change of emphasis in German vocational training aid. (MDH)

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Environmental education

Education summit to decide on studies reform

Foreigners in school and profession

Change of emphasis in German vocational training aid

Talent promotion

Jens Reich

A man with qualities

The 54 year old's outstanding quality is his youthful curiosity and joy in experimenting. This is what friends and companions say who got to know the doctor and molecular biologist outside his profession. During the change-over to democracy in the ex-GDR (1989/90), Prof. Jens Reich was one of those who thought up peaceful ways for the transition, first at the Round Table with the old powers, and then as a freely-elected parliamentarian.

Once the experiment had proved successful and German unity been restored, he returned to science. For a while, he accepted an invitation from the Cancer Research Centre in Heidelberg. Today, he is working once more in Berlin, his adoptive home – at the Max Delbrück Centre for Molecular Medicine (MDC).

Another of Reich's special qualities is his unusual love of the word. During the turnaround phase, he wrote weekly commentaries in magazines. Before this time, he had already written under a nom de plume in western newspapers about life in the GDR. With the very revealing title of "Farewell to Lifelong Illusions", he devoted a book to the intellectuals in the ex-GDR.

Today, Jens Reich is one of Germany's best-known scholars. When the leading American magazine *Science* reported on the reunification of the sciences in Germany in the spring of 1993, Jens Reich was naturally included – in word and picture.

His academic career did not progress easily. As a computer specialist in the fields of biology and medicine he was able to "sit in" at the Soviet Academy of Sciences and became head of the mathematics department at the GDR Central Institute of Molecular Biology. Even so, his sphere of activity was limited because he refused to join the party. This was possible in his case and that of other stubborn minds because they were indispensable in their field. True, Reich's non-conformism cost him his post as departmental head and the opportunity of contacts with the West in 1984. Thus, it was only after the turnaround that he was able to see for himself "what is being achieved in Harvard (USA)" – which he found "admirable".

Jens Reich is a scientist with an eye on the economy and society. Unlike many other intellectuals, he does not resort to distant cynicism or resignation. His Christian faith plays no small part in his upright attitude. To this must be added the incentive he receives from his family, particularly from his three (now) adult children for whom the "cooped-up existence" in the GDR was never enough. "Anyone who plays dead is rightly buried," says Jens Reich. This he now relates to what he considers the lack of self-confidence in the new *Bundesländer* (federal states). This will undoubtedly all be different in ten years time – at all events at his institute. ❐

Hermann Horstkotte

Solar filling station commences operations

This solar filling-station with 112 solar modules commenced trial operations in Berlin in July this year. "Filling-up" needs a relatively long time: it takes no fewer than eight hours until the mini-bus, which has been chosen for the experiment, is fully charged. It then has a range of 70 kilometres.

Photo: dpa

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The dual system in Germany

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Final examination after eight to nine semesters?

Education summit to decide on studies reform

Experts recommend dividing studies into two parts: a professionally qualifying phase followed by a doctoral studies course for the qualification of young academic staff. A politically controversial debate is also concerned with the question whether the hitherto successful education system lines up with the demands of a modern society.

The "Education Summit", which has been continually postponed, is now scheduled to take place in December 1993. These "top-level talks on education policy", as the summit is called officially, are designed to rectify abortive developments in the school, higher education, research and vocational training sectors. Money is also to be discussed. It is the latter, of course, which is the sore point since the *Länder* (states) are calling for more federal funds for a wealth of commitments. Federal Finance Minister Theodor Waigel, however, has drawn attention to the highly limited financial leeway.

"We must see to it that education, training and science remain a German hallmark." Kohl stated at an Education Policy Congress of the Christian Democratic Union (CDU) in Wiesbaden in March this year. To this end, a quality-enhancing reform of schools, universities and colleges and a strengthening of the dual vocational training system (which takes place simultaneously on the job and in a vocational school), which is threatened with emaciation as more and more young persons flock into higher education and more and more training places remain vacant, at least in the West German *Bundesländer* (federal states), is needed. And yet it is because of this very dual system of on-the-job and vocational school training that Germany is envied in the USA, France and the United Kingdom. Such matters are to be discussed, not just between the Federal Chancellor and the prime ministers of the 16 German *Länder*, but also with social groups, with representatives of the economy, the trade unions, higher education and students. The latter recently protested in Bonn because they did not feel themselves sufficiently involved in the preparations.

The "Education Summit" is being prepared by a group of senior civil servants who have been appointed by the prime ministers of the *Länder* and the Federal Chancellery. The "*Eckwertepapier*" (basic values paper), which they have drafted, has now become known. Something worthy of note is the fact that, in this paper, the Federal Government and the *Länder* have drawn very close across political party lines in matters concerning structural improvements in higher education and vocational training. Schools are quite another matter. Although the CDU is also striving for reforms in this sector, it is unlikely to meet with much success since the Federal Government bears no responsibility whatsoever for the school system. This is the responsibility of the *Länder* which vigorously defend their "cultural sovereignty". In the case of higher education and research, on the other hand, joint commitments were agreed on through an amendment to the Constitution years ago. In the case of vocational training, the Federal Government is responsible for the on-the-job component, the *Länder* governments for the classroom element.

There was general agreement in the working group on the need for structural reform in higher education. By "structure" is meant a shortening – at long last – of the excessively long periods of study at universities – seven years on average. The exuberant wealth of content is to be reduced, studies to be given a "clear-out" – to make them "studiable" in four to five

Yesterday... lecture at the University of Heidelberg in the year 1502.

Photo: Universität Heidelberg

years once more. Something that the universities have been unable to achieve themselves is now to take place under pressure from the Federal and *Länder* governments. On the stocks is an initial "professionally qualifying" phase lasting four years (maximum five years in the case of the natural and engineering sciences) to be followed by a minority going on to take their doctorate. This has been protested by the more left-wing-oriented student associations. Social injustice, "elite studies" for a few are feared. Conservative groupings, on the other hand, have raised no objections to this bisection of studies, provided the first phase is not "academically emasculated". But there is more in the paper: anyone exceeding the *Regelstudienzeit* (period within which a course must be completed) should pay study fees, and, in those cases where this period is considerably exceeded, even be sent down, i.e. struck off the university register. It goes without saying that all student associations are opposed to this. Something which is concerning university professors, on the other hand, is a statement in the paper to the effect that "allocations of funds should be based on success and quality criteria". In plain English, this means – as in other EC states – that more funds are to be allocated if there is evidence of particularly good achievements in teaching and research, but fewer funds if they are not so good. Some countries have already introduced this procedure. Unlike the United Kingdom or France, however, there are still no indicators or other yardsticks to evaluate teaching and research achievements.

The *Fachhochschulen* (colleges for higher professional training) are causing the respresentatives of the state and the economy, and themselves, fewer worries. Their courses are short, eight semesters, practice-related, and highly thought of by employers. Even so, they, too, are overcrowded and have to turn away many applicants who, of necessity, then enter the universities. This is to change. The number of places at *Fachhochschulen* in West Germany is to be increased by 50,000 to 350,000, and in East Germany, where this type of higher education institution is new, to 52,000. By the year 2000, every third student is to study at a *Fachhochschule*. It is every fifth at present.

Today... lecture at the University of the Ruhr, Bochum.

Photo: Manfred Vollmer

Here, the Education Summit is to point the way. Money will have to be pumped into higher education if it is offer the 1.8 million students good teaching, care and advice and, in addition, undertake excellent research. It is reckoned that very soon 40 % of a young persons' year group will embark on a course of study – instead of the present 30 %. Members of the Government Coalition would prefer more persons being interested in the dual vocational training programme. One of the Summit's themes will be how to make vocational training more attractive. It should be liberated from the stigma of being a cul-de-sac from which advancement to managerial positions is hardly possible.

There is a consensus between all parties on this point and, as seldom happens, between the economy and the trade unions: admission to higher education institutions should be made available to talented working persons – even if they have no *Abitur* (university entrance qualification). Their chances of promotion are to be improved both in the economy and in the civil service. There is no general agreement, however, on the Federal Government's demand for the creation of special training courses for the less able and the more able. The German Social Democratic Party (SPD) and the trade unions are opposed to "differentiated treatment". The last item on the agenda – "Length of Schooling to *Abitur*" – might as well be scrubbed. The majority of the *Länder* have an SPD government and are unwilling to reduce the length of time spent at school from 13 to 12 years. The CDU has been calling for this for years – and now even more urgently in view of the EC single market. Now a fresh wind is blowing through the debate: four out of the five new *Bundesländer* want to stick to their *Abitur* after 12 years – as was customary in the ex-GDR.

Things will become a little less pleasant when talk turns to money. For higher education alone, the *Länder* are demanding DM 4 billion more from the Federal Government. The costs for vocational training reforms are not even stated in figures in the *Eckwertepapier*. Political observers are of the opinion that, although agreement may be reached on certain basic positions in the meeting with the Federal Chancellor, this is not likely to be the case in finding a key to the financial problem. ❐

Brigitte Mohr

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The responsibilities of schools in the environmental education sector

Resolution by the education ministers of the *Länder*

In the Federal Republic of Germany, the responsibility for the content and organization of education, including schools, is the responsibility of the *Länder*. The guiding principles for individual measures are coordinated by the KMK (Standing Conference of the Ministers of Education and Cultural Affairs of the *Länder* / federal states) of the Federal Republic of Germany. On 17.10.1980, the KMK made the following statement on environmental training i.e. education, in schools:

"Relations with the environment have become a matter of life or death for both individuals and mankind as a whole. Consequently, it is part of the duties of schools to create an awareness of the environment in young persons, to promote their readiness to treat the environment in a responsible manner and to educate them to adopt an environment-conscious pattern of behaviour which will be effective beyond their time at school.

In this respect, the school is all the more committed in view of the fact that the pollution of the environment has increased in an ominous manner in the last few decades. Because of their educational mandate, schools can and must make their contribution to help solve this urgent problem.

By conveying insights into the complex correlations of our environment, schools are to indicate the problems which arise from the changes. Man is both the cause and victim of environmental changes. Since the pollution he causes recoils on him, he is also responsible for the consequences of inroads into the system of environmental conditions. He must not base his inroads merely on the short-term advantage for people living today. In his responsibility for future generations. On the one hand, he must ensure a balance between the appropriation and use of natural assets and the conservation and protection of natural foundations, on the other.

An attempt must be made, by means of insights of this manner, to develop an awareness of the environment. It is only from this that the readiness to use natural resources in a responsible manner and to ward off the threats to life's foundations can grow. In this way, education designed to achieve environmental awareness and environmental protection can promote understanding and a positive attitude to the problems to be solved in equal measure. In this context, it must be made clear to pupils that, for the protection of life's foundations, the right of each individual to personal development must be reconciled with the right of general welfare.

The aims of environmental education can be realized with the content of various subjects or in subject-overlapping environmental events. In this respect, environmental education is a subject-overlapping principle which imbues the natural scientific and sociological sectors in like manner.

Within the framework of these aims, pupils should, in particular,

- familiarize themselves with the rights and duties of the citizen as enshrined in the constitution and laws, to share in the responsibilities involving care of the environment and environmental protection;
- be motivated to observe and study the environment in a purposeful manner;
- gain an insight into ecological correlations and get to know the effect of disorders;
- get to know the causes of environmental pollution and environmental changes which, in some cases, can no longer be reversed;
- recognize the correlation of ecological, economical and social influences which has led to the present state of our environment;
- realize that the preservation of the diversity of living organisms and landscape is not only vital to the safeguarding of present natural foundations of life, but also for future generations;
- realize that environmental pollution is an international problem and a matter of life or death for the whole of mankind, and thus that care of the environment represents an international commitment, for which highly industrialized countries must assume particular responsibility;
- realize that responsible action on the part of individuals and society is necessary to safeguard the environment for man which he needs for a healthy existence worthy of humans;
- realize that care of the environment includes the clash of opposing interests and consequently that a careful weighing-up of economical and ecological viewpoints is necessary.

The education ministers and senators of the Länder agree to ensure the implementation of these principles and aims in education designed to achieve environmental awareness and environmental protection and their inclusion in in-service training for teachers.

This resolution supersedes the resolution by the Education Ministers Conference of 30.09.1953 on Nature and Landscape Conservation and Protection of Animals."

A future commitment

Environment policy is still restricted in the main to dealing with individual environmental problems by means of state regulation and technical solutions. Of equal importance for the preservation of the foundations of life, however, are changes in man's attitude to the environment. Environmental education at an early stage is an indispensable part of precautionary environment policy.

The tree's course of life also relates man's history. Photo: bonn press

Environmental education

The aims are clear – their implementation in school difficult

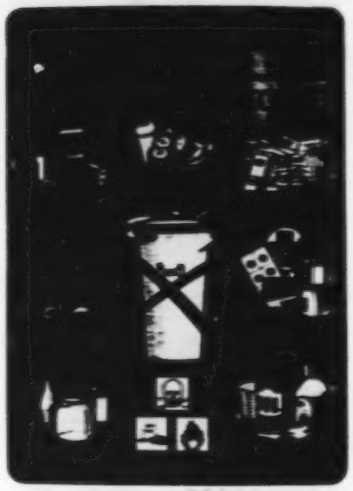
Dying forests, greenhouse effect, ozone hole, radioactive contamination, chemical accidents. The media is full of these terms daily.

Schools, too, have had to tackle the subject of "environment" for the last 15 years. "Eco-education", "environmental education", "educational ecology" – the large number of terms indicates the trouble education is having in finding a name for a sector, the didactical processing of which is raising a lot of questions. After all, it must not be forgotten that the directives from the education ministries require of the teacher far more than the simple teaching of knowledge. On the contrary, politics have given educators the job of teaching children and young persons environmental behaviour, for which there have been no models or concepts so far. "The purpose of environmental education is to encourage an affectionate understanding of nature," it states in the Bavarian Education Ministry's directives, "and to kindle the readiness to help find a solution to existing environmental problems."

"Teachers in schools are not ecological pioneers just because they have been given the task of imparting environmental education," says educational scientist Karl-Horst Dyckhoff from Münster University. Although the ministry directives provide a certain amount of scope, how this is to be made use of is left entirely to the initiative of the individual teacher. Curricula also recommend teaching environmental education on an interdisciplinary basis, wherever possible project-related and in the open countryside. But teachers on the spot frequently do not know how to fulfil these requirements within the narrow confines of the time-table, bulging curricula, meticulous separation of subjects and the omnipresent pressure of having to give grades.

"What the ministry has not done is to comply with our request to set up at least one eco-station in every region for school and out-of-school purposes," complains Albin Dannhäuser, president of the Bavarian Teachers Association (BLLV). "The same applies to our demand for the appointment of someone responsible for environmental matters, a specialist adviser for every region." After all, very few teachers heard anything about environmental education during their training. They are now being asked to teach something they have never learnt themselves.

Environmental education is confronting education institutions with the same problems at home and abroad. Consequently, a good three years ago, the international Organization for



Where does one put the refuse? Not everything belongs in the normal trash can. Some things are too valuable, others too dangerous.

Photo: Inter Nationes

Economic Cooperation and Development (OECD) began comparing points of departure with regard to solutions in its member countries. Australia, Finland, Hungary and Austria were examined. It is the Federal Republic of Germany's turn this autumn. The OECD investigating experts have made a demand which will undoubtedly also come the German authorities' way in the autumn: a larger budget for environmental education and the firm enshrining of new points of departure for teaching it in the education system.

Admittedly, individual classes in almost half of all Bavarian schools participate in keeping the countryside neat and clean, in plant projects or the adoption of streams. Even so, ecological lessons in school are the exception and only take place if a committed teacher ventures beyond the narrow confines of the "cramming mill". The road to success is a narrow one. Educational studies at the University of Erlangen-Nuremberg show that, although children display a marked willingness to behave in an environment-compatible manner and to sort out refuse, for instance, they nevertheless lack the opportunity to grasp the broader correlations in their "overall context" with the result that they often fail to realize the damage their actions inflict on the environment. Emotive terms used in the adult world – such as rain-forest destruction and greenhouse effect – remain, for the most part, abstract terms for pupils, says Georg Pflingersdorffer from Salzburg University. In studies undertaken among *Hauptschule* (main school) leavers in Munich and Salzburg, he discovered that, although the ozone hole and rain forests had been dealt with in class, the pupils had no knowledge of the vital resources on the spot. "For them, water came from the tap, electricity from the power point, apples from the supermarket," says Pflingersdorffer. "If we succeed in making the pupil's own living world the pivot in the teaching of ecological knowledge, action will acquire an increasing measure of relevance." If the local reference is missing, teachers will not achieve their goal.

Germany's ecological school initiatives are slowly beginning to orient themselves towards the new findings. More and more teachers are going with their classes into the fields and woods, making maps of wetlands, recording rare animal and plant species or taking water samples. And quite frequently, working on the spot guides children from realization to action. When school classes take part in local council meetings, call for nature reserves and make the results of their work known in public, the dividing line between environmental and political education becomes blurred. ❐

Dr. Geseko v. Lüpke

Experiencing nature. German Environment Minister Klaus Töpfer with children in an autumn wood.

Photo: bonn-sequenz

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Qualification as environmental consultant in the trades

Pilot project: Blue Angel

Intensification of ecological farsightedness

How is a joiner to dispose of wood remains covered in paint or plastic? Where should a painter put the remains of his lacquers? In the dustbin? Or maybe to the special refuse collection centre? And may a hairdresser tip the chemicals used for dyeing hair or permanent waves into the sewer unprocessed?

Almost every owner of a handicraft firm must now concern himself with such questions and problems which are all to do with environmental protection – whether he wants to and can – or not. Requirements of this nature for the protection of the soil, air and water apply to all businesses, no matter how small. Contraventions can result in – sometimes quite hefty – fines. In the case of small handicraft firms, employing 8 to 10 persons, it is obvious that hardly one of them can afford to employ someone who is only concerned with this sector – although the constant flow of information on the new environmental laws, environment-friendly raw materials and techniques – and their application in the firm – could quite easily occupy one member of staff full-time.

The skilled trades must not fall behind in environmental matters.

Photo: Bundesbildstelle Bonn

To ensure that the handicrafts do not fall behind in environmental matters, the idea was conceived some years back of finding solutions embracing all types of business. Interested persons in the handicraft sector should be trained in such a way that they are in a position to provide advice on all environmental questions arising and translate them into suggestions in the business concerned, work out solutions embracing other handicraft firms and identify the market opportunities in environmental protection. The concept of a special training course for "Environmental Adviser/in Handicraft" was born and, from 1990, was put into effect within the framework of a pilot project – which has now been concluded – by the Federal Institute of Vocational Training (BIBB). In collaboration with the Hamburg Chamber of Handicrafts and its Centre for Energy, Water and Environmental Technology (ZWEU), the BIBB developed a further training course to cater for all professions and embracing all fundamental bases and applications. The course lasts five semesters. The target group are self-employed master craftsmen, journeymen and journeywomen with at least four years professional experience. 150 persons have already successfully completed the training course, says Sabine Möller from the

Where should the painter put the remains of his lacquer? Photo: Center Press

ZWEU. She stresses that "a great deal of idealism and interest in the subject are necessary" – after all, the "Environmental Adviser" qualification course takes place "on the side", two evenings a week.

The two-semester basic segment of the course (100 periods) is initially concerned with the acquisition of knowledge in the chemistry, physics, ecology, economy, environmental and environmental legal sectors. The three-semester main segment, once more 100 periods, deals in a highly concrete manner with environmental protection measures. The teaching content includes resource-sparing use of energy, protection against harmful effects on the environment and conservation of lakes and rivers, avoidance and disposal of waste, environment-compatible materials, marketing and much more. The basic and main study segments culminate in an examination and the award of a certificate. Klaus Budig, sanitary engineer in Hamburg and owner of such a certificate, considers this training as excellent. He states that about half his customers are interested in ecological building and living. He is now in a position to give them competent advice. Admittedly, "you occasionally rub people up the wrong way on a building site. Not so much the persons who have commissioned the building but many an architect who just refuses to believe that a 'simple artisan' possesses the environmental expertise they lack themselves." "How do you know that?" Environment adviser Budig has now grown used to this, for on a building site where several different trades work together, the knowledge he acquired during his environmental training stands him in good stead. He regards the fact that the training embraces so many trades as an "enormous advantage".

He was able to gain insight into other handicrafts, which has given him the opportunity to make quite different assessments on a building site as far as environmental matters are concerned. The training he received in environmental law is also a great help. "One learns to read more carefully and see the finer points," he explains – something which is out of the question in everyday craft work. Overall, during the two years of study, with its extensive and diverse learning matter, he was able to increase his "perspective" quite considerably.

There is no doubt in the mind of Heinrich Tillmann, head of the pilot project, that this training is particularly demanding. "The adviser must be competent in all areas," he points out – and in such a way that his knowledge can be applied with particular reference to the trade concerned. Consequently, Tillmann demands that "Environmental Protection Adviser" be made a full-blown profession – in the sense of a state-recognized further-training occupation with prescribed further training and examination regulations. What is more, the great demands which can be made of an environmental protection adviser are not restricted to expert knowledge. This is why Tillmann maintains that the teaching of social and communicative competence is just as essential. After all, the ability to convince is an inseparable part of the advice. Environmental protection measures are usually linked with costs, result in internal adjustments – such as not using a certain product or material – and consequently do not always arouse unbounded enthusiasm on the part of business proprietors. As a result, people are needed who not only work out solutions but are also capable of convincing persons of their usefulness to the firm. ❐

Angelika Hoch
(Süddeutsche Zeitung)

ECOLOGY ESTABLISHED AS A DISCIPLINE

Wolfgang Haber: one of the first environmentalists

"You may be a first-class ecologist but, as such, you will remain a second-class scientist." This typical assessment of environmental research was addressed by one of the thesis supervisors to Wolfgang Haber, an up-and-coming young scientist, when he applied to take his doctorate in 1957. In the meantime, the then young man has now become a seasoned professor of landscape ecology at Munich Technical University in Weihenstephan. In appreciation of his "life's achievment in respect of environmental precaution and ecological research" he has been awarded the environment prize by the German *Bundesstiftung Umwelt* (Federal Environment Foundation). In all, the prize is worth DM 1 million. Haber shares it with the household-appliance manufacturer, *Foron*, in Saxony, which has brought the first refrigerators completely devoid of "ozone-killers" onto the market.

In the reasons for the award, the Foundation states that Haber did "pioneering work" in his particular field. Even during the days when viewing things from the ecological angle were not taken very seriously, he established standards in his discipline which eventually led to its recognition. Among other things, he founded *Biotopkartierung* (mapping biotopes), i.e. making inventories of particularly valuable areas of countryside. He was largely involved in the drawing up of nature conservation laws and vigorously supported the creation of the first national parks in Germany. He says he already had intensive contact with animals and plants in his parental home. His father, a would-be biologist, had laid out a mini-botanic garden behind their house and encouraged his son to play in the open countryside. "At that time I learnt to recognize almost all the birdcalls," he still says enthusiastically. A decisive stage in the career of the now 68-year-old Haber was his work in a natural history museum: "It helped develop my didactical skills, since it involved the making of complicated biological facts understandable."

He profited from this ability to make his views comprehensible in his later activities in numerous political advisory bodies on nature conservation. At the university in Weihenstephan he is chiefly concerned with the question of how the countryside can be shaped in an environmentally-compatible manner. He describes the fact that he is a professor in the landscape-conservation course of study, as "a forunate circumstance". Here, he says, a classical science has been enriched with creative elements. The students and colleagues in this subject had continually spurred him on and stimulated him "because they constantly displayed alert crtitical interest and often offered surprising achievements".

In recent years, Haber has been heavily involved in the setting up of the Leipzig/Halle Environmental Research Centre. Since 1990, he has headed *Intecol*, the umbrella organization for the International Association of Ecologists.

The environment prize has been awarded for the first time this year. By means of this distinction, the Federal Foundation wants to particularly promote environment-technogical innovations in small- and medium-sized firms. The Federal Government has provided capital to the tune of DM 2.5 billion for this purpose. Approx. DM 200 million is available annually for the promotion of innovative projects. Since its foundation in 1991, a good three-quarters of the funds have flown to the new *Bundesländer* (federal states). ❐

Peter Becker
(Tagesspiegel)

Successful environmental policy only possible with environmental training

The Federal Ministry of Education and Science has considerably influenced and accelerated environmental training in Germany by means of a large number of initiatives and incentives since 1986. This was pointed out by Dr. Norbert Lammert, Parliamentary Undersecretary at the Federal Ministry of Education and Science, when addressing the German *Bundestag* during the debate on questions relating to environmental training and environmental science. "A successful environment policy is possibly conceivable without extensive and early environmental training, but not very promising," said Lammert and demanded that all citizens be put in the position where, for instance, they were acquainted with legal and technical norms, with measured values and environment-compatible checks, with product analyses and eco-balance sheets.

According to Lammert, the Federal Ministry of Education and Science has invested DM 50 million in projects, pilot schemes and initiatives on environmental training. The measures ranged from project promotion by the Federal Government-*Länder* Commission for Educational Planning and Research Promotion (BLK) and industrial pilot projects in firms to the integration of environmental training in training regulations and higher education courses.

On the initiative of the ministry, the EC Council of Ministers and the EC education ministers had approved a decision on environmental training as far back as 1988. Lammert also drew attention to the recommendation to put into practice the findings of the Commission of Enquiry on the "Protection of the Earth's Atmosphere", by means of which "highly regarded milestones" had been set up for the continuation of discussions on content from the aspect of a global environmental problem. AZI initiatives had been embodied in the German position at the United Nations Conference on the Environment and Development in Rio de Janeiro. "There is unanimity in the Federal Government on the fact that environmental training and environmental sciences are indispensable components of a modern precautionary environmental policy," Lammert told the assembled *Bundestag*. The complexity of ecological content, he continued, calls for a comprehensive, subject- and problem-overlapping education policy which will help learners to grasp the difficult correlations between economic, ecological, technical, social and cultural questions and to translate them into action in the home, job and spare time. ❐

Environment-related courses of study

Because of the growing demand for environmental specialists, the Institute of the Germany Economy has published a "Studies Guide for Ecological Courses". The Institute approached 67 different universities. The result: there are currently 111 courses of study with their own or supplementary specialized ecological training. 85 culminate in a professional qualification. The remainder follow on an initial course of study as continuation or supplementary courses. In East Germany, where the demand for environmental specialists is likewise growing, there are 19 ecological courses of study, particularly in the environmental technology and environmental protection sectors. The majority of the eco-courses are to be found in the natural and engineering sciences. There are, however, 22 independent "environmental science" courses, mainly at the further study stage, and others in agricultural science and forestry, occasionally in the economics and law sectors. The University of Saarbrücken offers a four-semester continuation course leading to a European degree (diploma) in environmental science, including study visits to Belgium, France and Luxembourg. B.M. (FAZ)

Voluntary eco-year to be introduced

The German *Bundestag* has decided to introduce a voluntary ecological year. According to the new law, young persons between the ages of 16 and 27 can work voluntarily for between six to twelve months in the environmental and nature conservation sector. This move falls into line with the increased level of ecological awareness on the part of young people, spokespersons from all parties emphasized and drew attention to the example of the voluntary social year. At the present time, 1,000 persons are participating in pilot schemes for the ecological year in Schleswig-Holstein, Lower Saxony, Saxony-Anhalt and Saxony. Participation by young persons from non-EC countries is also to be made possible. Volunteers for the eco-year will receive pocket money (maximum DM 400) for their services, plus free board and lodging. According to the law, in the main, the young persons are to perform work of a practical nature within nature conservation organizations, environment associations, communes and youth assistance bodies. Also according to the law, which takes effect on 1 September 1993, this voluntary service can be counted towards practical training. In addition, the young persons will have social security cover. In other words, they will be on the same footing as trainees.

Ecological structural change: a challenge for higher education

Ernst Ulrich von Weizsäcker on the global environment crisis and the tasks of higher education and science in the 21st century

The 21st century will be the century of the environment, predicts Ernst Ulrich von Weizsäcker. Yet higher education is badly prepared for it. The way in which universities must consequently change has been outlined by Ernst Ulrich von Weizsäcker, president of the Wuppertal Institute of Climate, Environment and Energy. Here are extracts from the lecture he gave at the University of Hamburg.

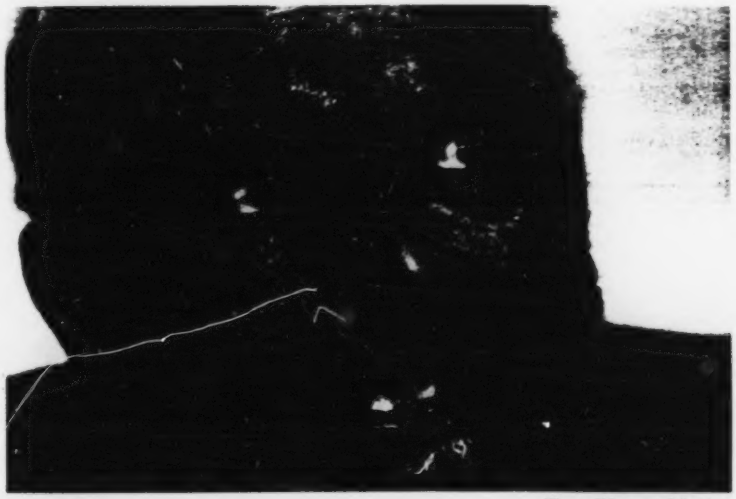


Photo: Wuppertal-Institut

Higher education suddenly finds itself in another crisis. Students have plucked up courage once more to address this fact, and politics has rediscovered its interest in higher education.

I link this theme with the much greater crisis which is afflicting our world – the environment crisis. The latter will inevitably worsen in the coming decades so that the next century will go down in history as the "century of the environment". I will try to deduce from this a number of demands for the pending reform of higher education.

Per second on earth, we are currently losing around 3000 sq. metres of forest and maybe 1000 tonnes of topsoil. Per second ,we are manufacturing almost 1000 tonnes of greenhouse gases which could cause the climate to enter a fateful downslide. If the speed of global warming is to be at least returned to a tolerable level, climate researchers reckon that a 60 % worldwide reduction in greenhouse-gas emission is required in the next four to five decades.

The major initial step towards finding a solution seems to me to to be a systematic change of direction in technical progress. In the 150 years of industrialization and technological development, we have managed to increase the productivity of a human working hour by a factor of perhaps 20. At the same time, what we have not managed to do is to increase the productivity of energy or, in more general terms, nature.

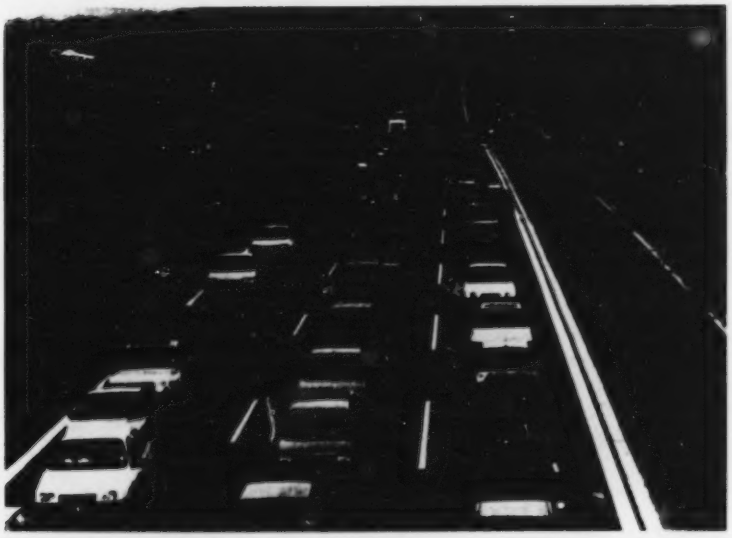
There is no scientific or technical reason why energy productivity cannot be increased by a factor of 5 or 10 – or likewise 20. Let us take a factor of 4 as a manageable and definitely achievable figure technically. That would mean that we would produce and distribute twice as much prosperity worldwide and yet only consume half as much energy as today. Half the remaining half could come from renewable energy sources if steps are taken to ensure that the latter gradually become commercially more rewarding than fossil and nuclear energy. The largest part of the climate problem and part of the nuclear energy problem would then be solved. The price signals could come from a gradual increase in energy and raw material costs – so gently that the economy does not collapse but persistently enough to achieve an influencing effect.

Five challenges for higher education

Quadrupling energy productivity – this as a first example of the challenge – would mean a complete reorganization of industry and human labour. Much of what is produced today under the illusion of unlimited availability of energy and raw materials and, with low transport costs, of an extremely labour-sharing nature and centralized would – such as in the case of energy – be produced to a large degree decentrally, with enhanced production depth and, in same cases, even "by personal efforts". In the domestic heating sec-

tor, for example, part of the centralized energy supply would be substituted by self-installed insulation, handicraft and decentralized solar energy production.

The requirement for engineering skills would not be less – but completely different from those of today. In point of fact, we would have to reorient ourselves with a fundamental reorientation of technology which would not only embrace energy, but also process engineering, architecture, transport engineering, regional planning, administrative law, the vocational school system, the public health system, our foreign economic relations – indeed, in the final analysis, our whole culture.



We must change the direction of progress.

Photo: Detlef Gräfingholt

The second remark follows on. It, too, in the first instance, concerns technology. The ungainly dinosaur-technologies of today and recent vintage, which are destroying nature, will have to be taken out of service. Combination technologies are on the way in, such as between micromechanics and surface chemistry, between information engineering and semantics, between microbiology and agricultural engineering, to mention but a few.

And now, a third theme must be addressed – something which will be of great importance for the qualification requirements of the 21st century: the chronic financial crisis of the public purse will not be solved unless many a benefit provided almost entirely by the state becomes the citizens' personal responsibility once more. This applies to parts of the social benefits, the public health system, the education system and environmental protection – only to the extent, of course, where social justice is not endangered in the process. But not only among the unemployed is there so much talent lying fallow which could be beneficial to other people or be used for environmental purposes – as soon as it becomes worthwhile. I cannot go into the details of the politically controversial realization of such ideas here. But I will permit myself to venture the forecast that there will be great changes in the care of the sick and elderly persons, education and environmental precautions, and that quite different qualifications will be required of individial citizens and the relevant experts compared with what we are used to today.

The fourth thing I would like to say about the changing scene concerns the internationality of our life. Europe (indeed, the whole world) is becoming more and more our natural habitat. Without a knowledge of foreign languages and a deeper understanding of people from other cultures, it is simply impossible to practice academic professions properly today. This, however, is still not playing an adequate role in higher education.

My fifth observation relates to lifelong learning. The notion that all the qualifications needed for an academic career can be acquired between the tender age of 19 and 25, is, of course, completely wrong. This is something that firms and state agencies, which employ university graduates, are also aware of. And, in secret, the universities know this, too. But all this knowing has produced almost no results so far. True, there are the first signs of further academic training. But the real change should come much earlier. If one realizes that initial higher education is only the beginning of lifelong academic learning, then courses of study, with their delusion of completeness, should be very different from what they are today. With average study periods of 14.7 semesters before taking the first qualifying examination, we Germans hold a sorry record!

This has also been realized with horror by the finance ministers of the *Länder* (states) and the education ministers, who are subordinate to them in the political power structure. And they are now seeking ways to remedy the situation.

But where should a start be made? Personally, I am of the opinion that the higher education crisis has very much to do with the crisis in science itself. The splintering of faculties into individual disciplines, the self-affirmation of the same in the relative academic societies, the appointment procedure for professors, the burying-of-heads-in-sand attitude to the obvious challenges of the next century, the high degree of refusal on the part of academics to seriously concern themselves with the consequences or utili-

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zation of their science, the obsession with an arsenal of methods – all this is not only part of the problem of higher education's miserable state: it is also part of the environment crisis.

But what has this to do with the environment crisis? Well, as long as the individual natural sciences continue to regularly produce new findings which are then made available for the efficient exploitation of nature or the creation and fulfilment of ever new consumer wishes, they are unintentionally contributing to the exacerbation of the environment crisis.

Usually, they are only summoned (and paid) to ease the environment crisis if statutory regulations or practical considerations on the part of the economy recommend this. And if serious environmental damage becomes visible – like the dying forests formerly – then there emerges an unholy alliance between science and industry. This means that first of all intensive research must be undertaken before any form of remedial measures can be implemented. And this research is once more mainly scientific as a rule. In the interest of both parties, science prefers to keep well clear of the economic levers which , in all probability, could help reduce much of the damage. For science, so much interdisciplinary activity is not so manageable; it does not produce neat publications. And, as far as industry is concerned, research of this nature would be a little too close to the *nervus rerum*.

But what has the splintering of disciplines got to do with the crisis in higher education and students' excessively long periods of study? First, there is the didactical aspect. Learning fundamentals and methods – something to which disciplines attach great value – is something which is extremely alien to the innate human learning process. We much prefer to learn things in their entirety, shapes, situations than elements and rules. Children learn to speak long before they learn letters or grammar. For anyone who has learnt to speak, the purpose of grammar (with a little guidance) presents itself quite naturally. Small wonder that the 'earning of "fundamentals" takes so much longer than foreseen in the idealized *Regelstudienzeiten* (time in which a student is expected to complete his studies).

The criticism goes deeper. Present disciplinary science is far removed from the Humboldt ideal of comprehensive understanding of reality. And whatever is researched within the disciplines is, as a rule, neither fundamental nor very innovative. After all, the pure disciplines have been largely done to death. The virgin territory is more likely to be found between the disciplines nowadays.

The perspectives of higher education reform in the 1990s

It would be going too far if I were – *en passant* so to speak – to attempt to outline the basic features of the long-overdue higher educational reform. Nevertheless, I will give a few indications of how, to my mind, higher education reform could be linked with the task of the century I spoke about.

1. The inevitable great themes of the 21st century should be included in the syllabus of a good higher education institution. Ecological structural change, North-South

The end or a new beginning? Photo: Inter Nationes

tension, reorientation of technology (subjects which affect just about all disciplines) should be as much part of the programme as mathematics, law or even sport. Interdisciplinary research projects and discussion groups could be a good way to start.

2. Interdisciplinary work should be rewarded and not, as has been the case so far, virtually punished with impediments to career. How about an internal rule at universities which does not allow institutes to be created unless professors from at least three different academic fields are involved? (Something similar to the way the EC reserves the greater part of its research money for projects in which a minimum of three countries is involved.)

3. Next-century universities should be organized on international lines linguistically. Events should be offered as a matter of course in English and, wherever possible, in several other European languages – and not just in the related linguistic discipline.

4. Courses of study should provide as much individual scope as possible. I consider studies reform along the lines of a modular system, which we discussed in the late 1960s, as more pertinent than ever. In my opinion, it is a mistake to think that organizing studies on school lines within the framework of standardized curricula would have a positive effect on the reduction of time spent on studies. Standard curricula should only act as safety nets for those students who have too little motivation and imagination to seek their own paths of study.

   For professors, of course, an audience of students from various disciplines is quite a different challenge from the present one. A system of individual care and guidance should be provided. This, in turn, for financial reasons, cannot be created other than by a developed tutorial system.

5. Higher education institutions must regard and organize themselves as academic further training establishments. The need is great, the availability poor. To a limited extent, moreover, a cost-saving effect could be achieved in adult education by including practicians in university teaching according to the principle of "learning by teaching". In so doing, they would be compelled (fairly effectively) to understand new subject matter so well that they could teach it to others.

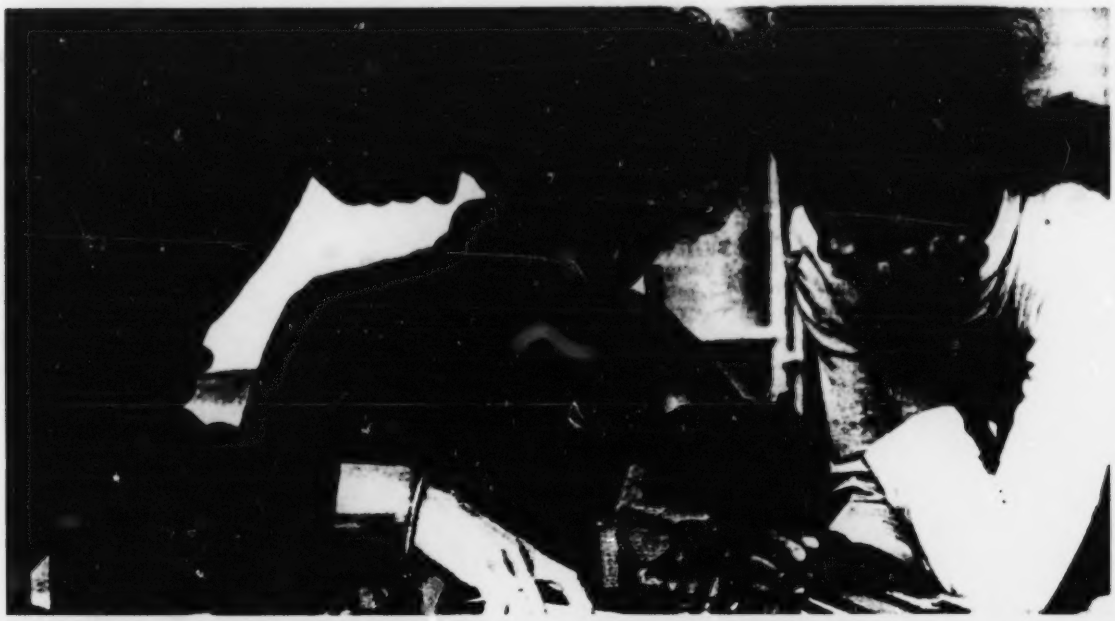
6. Universities should also be a central service institution for the immediate vicinity and region. Scientific databases, libraries, adult education, organization of courses on new technologies and simply centres for the exchange of ideas – these are all part of the functions of modern higher education institutions – functions which are steadily increasing vis-à-vis the classical functions. The far-reaching technological and ecological structural change in the economy calls for a marked degree of readiness to innovate.

It will be grateful for places where this new style of thinking is cultivated and where, without undue haste and competition pressure, it is possible to talk, read and think about the new perspectives which are being imposed on us by the structural change. ❐

(Frankfurter Rundschau)

The dying forests in Germany. Photo: dpa

Nature is still not on its last legs... Bundesland Mecklenburg-Western Pomerania. Photo: Bundesbildstelle



Foreign children are to have the same opportunities as their German contemporaries. Photo: Bundesbildstelle

Young foreigners in school and profession

Integration proceeding slowly but surely

Both in school and vocational training, the Federal Republic, finds itself in the middle of the integration of the second and third generation of foreign nationals residing in Germany. More than two-thirds of all alien children and young persons living between Aachen and Zwickau were born here. Every second of the 6.5 million foreigners has been at least 10 years in the country.

Have the children of foreign parents drawn level with their German contemporaries? Do young foreigners have the same opportunities in the training market as similarly-aged Germans?

The situation has steadily improved in recent years. This is the gist of the Federal Government's reply to a question put by the Social Democratic parliamentary party in the *Bundestag* in May 1993. The proportion of foreign children at *Gymnasien*[1] doubled between the years 1980 and 1990 – from 8 to 16%. The number at *Realschulen*[2] increased in the same period by two and a half times (from 6 to 15 %). And between 1984 and 1991, the number of alien apprentices in the West German *Bundesländer* (federal states) grew from 49,000 to 109,000, i.e. more than doubled.

Even so, compared with German children and juveniles, the number of young foreigners at *Hauptschulen*[3] and *Sonderschulen*[4] is still disproportionately large. Such as at the non-denominational *Hauptschule* in Wesseling, near Cologne. There are 11 girls and 17 boys in the class: 16 "aliens" and 12 Germans. Efthimios' mother went to school in Cologne. Nourdine, a Moroccan, came to Germany six months ago with his grandfather and unable to speak a word of German. Fehmi from Albania has been in Wesseling since 1989. The seven Turks in the class were all born in Cologne and speak good German. Hakan is the best in this subject.

This is a typical situation. According to details published by the Federal Statistics Office some 70 % of all foreign children attend *Grundschulen* (primary schools) and *Hauptschulen*. In the case of German pupils, however, there is a clear trend towards *Gymnasium*. Every third takes *Abitur* (university entrance qualification), only 15.5 % attend a *Hauptschule* and 3.1 % a *Sonderschule*.

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More foreign young persons than young Germans come to grief whilst undergoing trade training: every fourth young alien breaks off his or her vocational training course prematurely. Comparative figures in the case of young Germans are around 20 %, i.e. every fifth. According to findings by the BIBB (Federal Institute of Vocational Training), breaking off trade training prematurely is tantamount to giving up the idea of training altogether in the case of young aliens.

Although, for the most part, the children of foreign employees, who were born here, speak German well or very well, this is not reflected in their results in school or vocational training. What is the reason for this?

In its reply to the parliamentary question, the Federal Government stated it does not think that the climate in firms and vocational schools can be generally described as hostile to foreigners. The example of many major companies is known. Following the anti-alien criminal acts, they stated in a series of announcements via the press and billboards that they could not be viable without their foreign employees.

Earn regular money as soon as possible

There are differing reasons for young foreigners breaking off or not even starting on vocational training. It may stem from the fact that alien families are insufficiently informed about the opportunities of learning a qualified trade. Another reason is the reluctance, which still exists in many firms, to systematically address young aliens. A further ground is undoubtedly the desire (or the necessity) to earn "proper" money as soon as possible.

Often, however, young foreigners suffer from an identity conflict. Many parents came to Germany with the intention of earning money here and then returning home. Their children are growing up in a country where social life and its culture cannot, without further ado, be dovetailed with the traditional behaviour pattern of their families. The fate of many Turkish girls, who have little contact with other young persons because they must subordinate themselves to the strict customs of their parental home, is a good example of this problem.

What can be done?

The Federal Government has stated that one of its "major integration commitments" is to provide foreign children and juveniles as far as possible with the same opportunities as their German contemporaries. It is also up to young persons – both Germans and foreigners – to find bridges between languages and cultures. After all, integration calls for efforts on both sides. Their success, though, depends on the willingness of foreign families to accept the basic values of the German Constitution (separation of church and state, the equality of women, religious tolerance) and of social life.

The Federal Government promotes the integration of children and young persons by means of career advice specially tailored to the needs of foreigners. Brochures and films in the mother tongue, advisers with a knowledge of the required foreign language in schools, alien affairs officers at job centres all offer examples of this. According to *BAföG* (Federal Act concerning the Promotion of Education and Training), foreign juveniles and young adults are to receive the same financial assistance as Germans. The basic requirement: they must be citizens of an EC country, or one of the parents must have lived and worked legitimately within the country for at least five years. Further promotive opportunities are offered by the *Benachteiligtenprogramm* (Disadvantaged Persons Programme) in the Employment Promotion Act.

A project tried out in the Cologne area has turned out successful: the "Train Aliens!" campaign promoted by the Federal Ministry of Education and Science. The pilot project's central coordinating point was an advice office for the qualification of young foreign workers. It successfully brought together firms looking for trainees and young aliens who were qualified to embark on trade training (but had not done so). The result: between 1989 and 1992, the number of young foreigners undergoing vocational training doubled – from 5 to 10.3 %. ❐

Volker Thomas

1 **Gymnasien** (grammar schools) are secondary schools which, in the normal course of events, follow on *Grundschule* (primary school) or Class 6 at the *Hauptschule* (main school). The final certificate *(Abitur)* represents a university entrance qualification.

2 **Realschulen** (intermediate schools) are secondary schools which are attended on completion of a *Grundschule* or Class 6 at a *Hauptschule*. Generally speaking the *Realschule* final certificate provides the basis for higher professions of all types.

3 **Hauptschulen** (main schools) are secondary schools: as a rule they offer five-year education courses and provide general education as the basis for practical vocational training.

4 **Sonderschulen** (special schools) are institutions providing full-time education for the promotion and care of physically, mentally or psychically disadvantaged or socially endangered children who cannot be taught with sufficient success at normal schools.

Vocational Training Report 1993

Lack of skilled workers established, but not glut of academics

Federal Education Minister Rainer Ortleb (FDP) shares the German economy's concern about the growing lack of skilled workers. According to the 1993 Vocational Training Report by the Federal Government, just under 500,000 training contracts were signed in the old (western) *Bundesländer* (federal states) in 1992 – considerably fewer than expected.

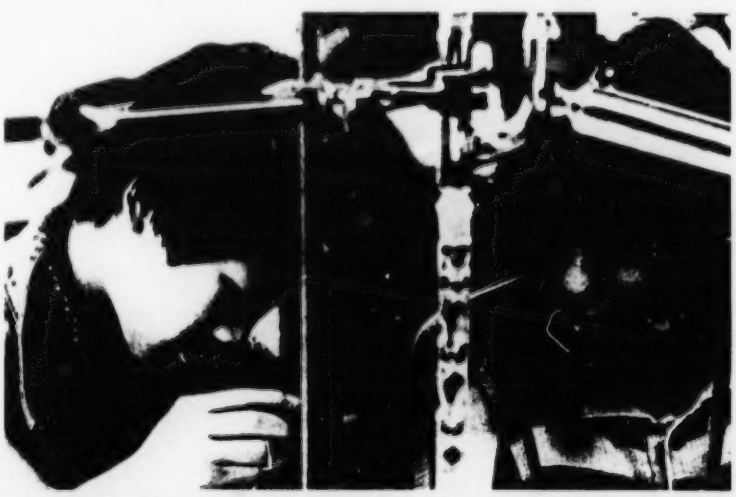
When publishing the extensive report – often called the "Chief Work on Vocational Training" – the Federal Education Minister nevertheless distanced himself quite clearly from the constantly voiced complaint by industry that there are too many students and too few apprentices. According to the Vocational Training Report, in 1992, 150,000 students successfully completed their final examinations compared with 500,000 young persons who acquired their skilled worker's or journeyman's certificate on successful completion of their training. In other words, there are three new journeymen to every one academic. Ortleb stated that, in the light of these figures, he was reacting "with restraint" to the reports on the imminent glut of academics. On the contrary, compared internationally, the number of German graduates was "more or less normal".

Not only the changes in educational wishes on the part of young persons and the trend towards increasingly better school certificates leading to studies have resulted in the reduction of the number of persons successfully completing vocational training courses. Demographic developments are also clearly reflected in vocational training statistics. At the end of the 1980s, the high birthrate years were finishing their vocational training whereas just about now the extremely low birthrate years were taking their trade and journeyman's examinations at the Chambers of Industry and Trade and the Handicrafts Chambers.

Ortleb called on the economy to make vocational training attractive once more by offering better incomes and professional chances so it can face up to competition from higher education. Furthermore, "successful completion of trade training should equate to an intermediate school (*Realschule*) certificate" to improve the public image of vocational training. A master craftsman's or technician's certificate should also be recognized as a university entrance qualification restricted to a specified field of study. Ortleb renewed his appeal for adults without *Abitur* (university entrance qualification) to be admitted to courses of study if they had proved their mettle in their job. In this way vocational training could be rid of the image that it was not open to higher professional paths.

Because of the lack of applicants, 120,000 training places remained vacant in the western *Bundesländer* (federal states) last year. In other words, whereas there are too few applicants and too many unfilled apprenticeships in West Germany, there is a marked lack of training-place availability in the new (East German) *Bundesländer*.

Considerable problems are particularly anticipated there in 1993. Ortleb reckons that a number of these young persons – some 20,000 – will find a training place in West Germany. At the same time, the Education Minister and other education experts are not unsceptical about a "Go West" on the part of young persons. It is feared that particularly able young persons will migrate to West Germany and, on completion of their training and having established new friendships, will hardly be prepared to return home.



Learning for the working world. Photo: Manfred Vollmer

The close integration of training with social requirements creates good professional prospects. Photo: Manfred Vollmer

The Vocational Training Report registers a further trend: more and more young persons are embarking on courses of study after successfully finishing their trade training. In 1985, the number of first-year students who had successfully completed an apprenticeship came to 21 %; by 1991 this figure had grown to 30 %. At *Fachhochschulen* (colleges for higher professional training), more than every second student has completed trade training. Studies, the report states, are "not taking the place of trade training" but regarded "as an attractive alternative to a professional career outside higher education".

The school and training structure has undergone considerable change in the last ten years in West Germany. In 1991, 34.7 % of all school leavers possessed an entitlement to study. This was no more than 19.4 % in 1980. Only 24.7 % left school with main school leaving certificate *(Hauptschulabschluß)* in 1991, compared with 34.2 % in 1980. In the same period, the number of young persons leaving school without any form of certificate dropped from 9.6 % to 6.8 %. Even today, between 10 and 15 % of a year are without any form of trade training and final certificate. The growing number of apprentices terminating their training contracts prematurely is regarded as problematic. Ortleb would like to recruit additional manpower from this group of young persons – who either do not embark on trade training or break it off prematurely – to fill the ever widening gap of skilled workers in Germany. In this context, the Federal Education Minister calls for greater "differentiation" to be made between the less and the more able youngsters undergoing training. Help and special programmes must be forthcoming for the less able; additional incentives should be offered to the more able.

The Vocational Training Report also examines the reasons for young persons breaking off their apprenticeships prematurely. This trend exists in almost all training sectors and trades. At the present time, almost every fourth (24.4 %) newly concluded apprenticeship is terminated during training.

The report explains that, in view of the favourable availability of training places, young person in West Germany are increasingly exploiting the possibility of revising their choice of firm and profession during training. Furthermore, the age and previous school education of apprentices have considerably increased in the last decade. As a result, a more critical attitude towards training has developed. At the same time, if needs be, a training contract can be dissolved without parental permission.

As a rule, according to the survey, several factors govern the premature termination of apprenticeship. There are also sex-specific differences. Whereas difficulties in theoretical training caused only a 6 % drop-out on the part of females, it was as much as 25 % in the case of males. Failing examinations was also not so relevant in the case of women (8 %) as opposed to men (16 %). Although marriage, starting a family or family requirements to do other tasks were the reason for terminating a training contract prematurely, the women are clearly ahead in the statistics.

Women, like men, terminated a training contract, in particular, whenever they no longer enjoyed the training (women 31 %, men 40 %). 30 % of the women and men gave difficulties with the instructors as the reason.

The Vocational Training Report describes the "Promotion of Talent in Vocational Training Programme" launched two years ago as highly successful. The programme, the Report states, is a contribution to the equal merit and attractiveness of on-the-job training and further training. It is designed to contribute to the safeguarding of a rising generation of able skilled workers, says the Report. The budget has been increased by DM 8 million to 26 million in 1993. These funds enable the annual acceptance of 3,000 scholarship (grant) holders at the present time. The promotive scheme includes language courses, further training abroad and concomitant further vocational training. ❐

Karl-Heinz Reith

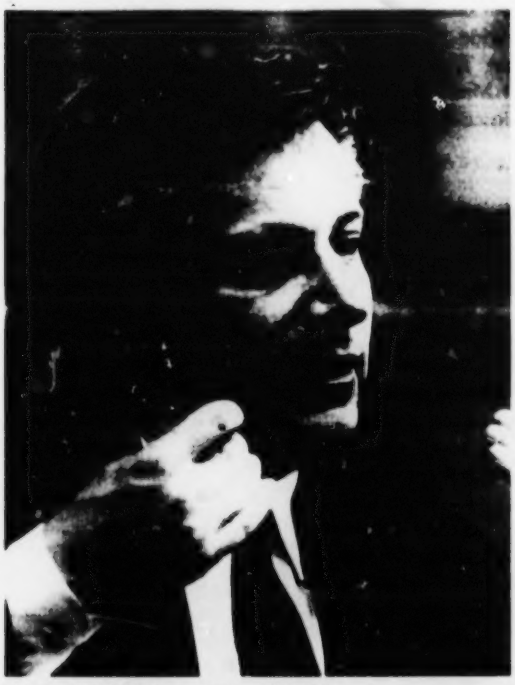
The promotion of gifted persons in the Federal Republic of Germany

by Federal Minister Prof. Rainer Ortleb for the *"Education and Science"* magazine published by Inter Nationes

Today, assistance for gifted persons and the promotion of outstanding academic achievements have become important components of the Federal Republic of Germany's politico-social and, above all, politico-educational activities. Initiatives for increased assistance for particularly talented children, young persons, trainees and students meet with general approval both in the political and public sectors.

There is growing consensus on the fact that the Federal Republic of Germany cannot afford to accept and promote talent only in sport and individual areas of art. We need academics and practicians who develop new ideas, and managers who can assert themselves on the world market. The promotion of special talent is necessary so that top achievements by the rising academic generation can provide the economy, and political and cultural life, with new impulses.

It is the purpose of the Federal Government's education policy to provide every individual person, by means of a differentiated educational and training programme, with the opportunity to develop to the full his or her particular talent profile. This results in a positive attitude not only for the disadvantaged – but for the gifted, too. The Federal Government's promotion of talent embraces all educational sectors.



Education Minister Rainer Ortleb.

Photo: BMBW

The basic qualification is the job of **schools**: the promotion of talent outside school has also proved successful as a purposeful additional measure. At the present time, the Federal Government is assisting young persons of school age in basically three sectors:

Numerous **research projects and pilot schemes** are making a contribution to basic research and the development of theories on the identification and promotion of special talent. Furthermore, they have the aim of setting up the means of providing pupils, parents and teachers with sound advice.

A further focal point in the Federal Government's promotion measures in the extramural sector are the nationwide **talent competitions**. They are offered in differing forms for many areas of interest. Set questions have to be answered in national competitions in mathematics, computer science, foreign languages and history. They represent an invitation to gifted young persons to develop their particular abilities and to put them to the test in a fair contest. During the competition rounds, the entrants get to know similarly interested and gifted persons of their own age with whom they often have no contact in the normal course of events. The national competition winners are entered for the International Science Olympiads. The special feature about the *Jugend forscht* competition and the national environment competition is the fact that the entrants submit projects, which they have undertaken on their own initiative, for adjudication by a jury. In this context, independent work is particularly encouraged and the energy and perseverance needed for carrying out experiments mobilized. Cultural and artistic competitions round off the contest programme.

As a further component in the promotion of exceptional talent, the Federal Ministry of Education and Science has

been running extramural courses in the form of an **Academy for Gifted Persons** since 1988. Selected according to strict criteria, the young persons, aged between 16 and 18, live together for 2 to 3 weeks and are taught in subject areas of their own choice by university professors, well-known artists and managerial staff from the economy. The experiments have proved successful. Consequently, it is intended to set up academies of this type on a permanent basis.

In **higher education institutions**, the promotion of gifted students is, by tradition, the responsibility of the university teaching staff. They are best placed to recognize academic talent and in a position to promote it in a purposeful manner academically. Gifted students, for instance, are invited to assist in research and teaching or they are given corresponding tasks as auxiliary staff.

In addition to this, the promotion of talent in higher education is also the statutory commitment of various private-law foundations and associations. At the moment, nine **talent-promoting institutions** are fulfilling this task in the higher education sector. All of them expect particularly outstanding achievement in studies and academic work. Besides these intellectual requirements, they lay great store – with varying degrees of emphasis – by the formation of personality, readiness to accept responsibility and commitment vis-a-vis the state and society, and by artistic and practical skills. They offer intensive academic and individual care, as well as material support in the form of scholarships. The Federal Government provides the talent-promoting institutions with an annual sum of about DM 120 million (1993) for more than 15,000 study and doctorate scholarships.

Students of exceptional ability at *Fachhochschulen* (colleges for higher professional training) are also to receive the same assistance as their colleagues at universities in the foreseeable future. On completion of studies, apart from the opportunity of being assisted by a talent-promoting institution to obtain a doctor's degree, there is also the chance of enjoying the benefits of the post-graduate promotion scheme financed by the Federal Government and the *Länder* (federal states). Over and above this, there also special **post-graduate courses**. On successful conclusion of studies, particularly well-qualified graduates work together in research teams on specific projects for a period of two to three years. During this time, most of the scholarship holders acquire a doctorate on their research project.

Whereas the promotion of exceptional ability has a long tradition in higher education and acquired increasing importance in the school and extramural sector in recent years, the **promotion of gifted persons in vocational training** was, for many years, not thought worthy of consideration. As a result, about two-thirds of all young persons, i.e. those who successfully completed their dual training (combined on-the-job training and part-time vocational school education) were excluded from any form of talent promotion. But there are also many young persons in this sector who are ready and able to achieve above-average standards. With the unique Europe-wide "Talent Promotion in Vocational Training" programme, the Federal Minister of Education and Science closed this gap in 1991.

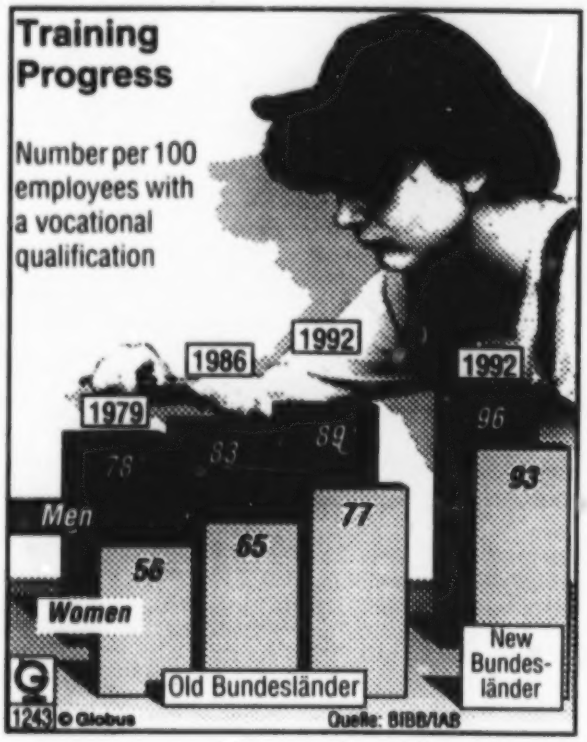
At the same time, this programme is giving a signal to support the realization of the politico-educational call for the equal value of general and vocational education. In this way, it is being made clear to young persons, and, in particular, their parents, that dual vocational training represents a promising alternative to general education paths. It is also designed to encourage *Abiturienten* (young persons who have obtained their *Abitur*, i.e. university entrance qualification) to regard on-the-job training and vocational school as a genuine alternative to studies. By differentiation in line with achievement, on the one hand, but especially the financing of particularly demanding further training and education activities parallel to practising a profession, the Federal Ministry of Education and Science is making a significant contribution to the enhancement of the attractiveness of dual vocational training, thus counteracting the foreseeable shortage of skilled labour in several employment-market sectors.

The particular talents of young persons becomes apparent during their vocational training, during the daily work at their place of employment, in their readiness to undertake further learning whilst pursuing their trade, in other words, not only in the academic or artistic sectors. In this context, the "Talent Promotion in Vocational Training" programme helps young people to develop to the full their professional skills. In 1993, some 8,100 young working persons will receive money for suitable further training measures from the fund of DM 26 million provided for this purpose. Up to DM 3,000 per person can be applied for annually over a period of three years. Subsidies are awarded to help cover the costs of particularly demanding measures which are directly linked with their occupation, which overlap other professional areas or which are concerned with general personal development, which help acquire social competences or the improved capacity of personal involvement in one's profession and in society. Persons in receipt of subsidies choose – from the wide range offered on the further training market – those measures which relate to their own personal requirements. Measures are also financed abroad. The programme offers young working persons the chance of equipping themselves for the new Europe which is opening up, and, above all, of learning foreign languages.

To ensure that an annual average of 3,000 persons, who have successfully completed their occupational training, can participate in these measures in the years ahead, increased budgetary funds are necessary and planned. Long-term, about 1% of persons successfully completing their dual training will receive support from this programme. ❐

Fewer and fewer unskilled persons

A modern economy's most important asset is invisible – it is concealed in human heads. Education, training and vocational qualification guarantee economic strength and prosperity far better than, say, rich mineral resources. The federal citizens seem to realize this. The number of unskilled persons entering working life is growing smaller and smaller; conversely, the proportion of those who have a vocational qualification in their pocket is growing (see chart). A sound course of occupational training is still far and away the best "insurance" against unemployment. A glance at the statistics shows that the percentage of unemployed persons among unskilled workers is particularly large. And the chances of untrained persons finding employment are also much less than for those with a final qualification.



German – US Academic Council

Intellectual bridge across the Atlantic

The Federal Cabinet has decided on the setting up of a German-American Academic Council. The aim of the new institution is to increase cooperation between the Federal Republic of Germany and the United States of America in the academic field.

Following the departure of German émigrés from the American academic scene, a new starting point with regard to content and organization is necessary to promote and deepen cooperation between the two countries in the natural sciences and the humanities.

Federal Chancellor Helmut Kohl and American President Bill Clinton announced the setting up of a council of this nature during their joint press conference in Washington on 26 March 1993.

The Council is to be made up of 15 outstanding researchers from both countries who will decide on subjects of interest to both sides. In addition, the body will promote the exchange of academics.

The concept is safeguarded by the cosponsorship of the four major academic associations in the natural science and humanities sector in the USA:

- National Academy of Sciences
- American Academy of Arts and Sciences
- American Council of Learned Societies
- and the Social Research Council.

On the German side, the concept is to be supported by the German Society for Promotion of Research, the Max Planck Society and the Alexander von Humboldt Foundation.

Announcing the Academic Council. President Clinton (right) and Federal Chancellor Kohl during a joint press conference at the White House in March this year.

Photo: Bundesbildstelle

Innovation strategies intensify industrial research in East Germany

Reorientation of extramural research largely concluded

Since German unification, the Federal Ministry of Research and Technology has undertaken diverse steps to restructure research and development in the new German *Bundesländer* (federal states). To this end, DM 1.75 billion has been made available for 1993 – 10 % more than in 1992.

The reorientation of extramural research has largely been concluded. About 100 new institutions in the Federal Ministry of Research and Technology's portfolio – providing 7,200 jobs – are now functionable. They are operating in forward-looking areas of basic research, such as health and environment research, energy research, new work substances and materials, biotechnology, information technology, opto- and microelectronics and application-oriented technological research and development. In 1993, the Federal Ministry of Research and Technology is making DM 730 million available for the institutional promotion of these research centres. A further DM 270 million is being devoted to the Scientist Integration Programme. Research programmes at these institutions are being funded to the tune of DM 420 million.

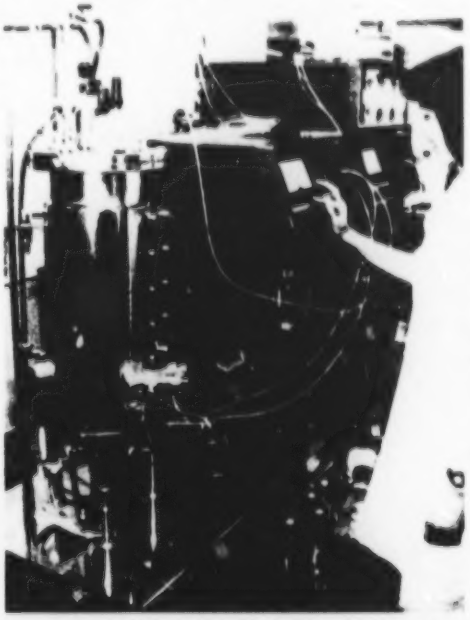
The situation with regard to industrial research, however, is critical. Between the years 1989 and 1992, the number of persons employed in this sector dropped from 87,000 to 24,000. Since only 2.5 % of research-intensive exports come from the new *Bundesländer*, particular importance is attached to the promotion of East German industrial research.

In order to boost industrial research, the Federal Ministry of Research and Technology's innovation strategies are being applied with a bundle of measures in four sectors:

- The setting up of an infrastructure to promote research and developement,
- Enhancement of technological competitiveness,
- Technology-related existential foundations,
- Promotion of an innovative *Mittelstand* (medium-sized firms).

By means of these innovation strategies, almost 9,000 highly qualified jobs are currently being created or preserved in the economy of the new *Bundesländer*. At the present time the machinery is being examined to see whether it should be modified or expanded. The promotion of research cooperation between industry and higher education is foreseen as the first addition. ❐

(BMFT-Journal)



Hans Knöll Institute of Natural Substance Research, Jena. Photo: Hans-Knöll-Institut

Institute explores climatic change

Concrete advice on policy and society with regard to global change is to be provided by the PIK (Institute of Climatic Research), Potsdam. The foundation of the Institute goes back to a recommendation by the *Wissenschaftsrat* (Science Council).

The PIK is unique in Europe. It is devoted to a new scientific field which concentrates the natural, economic and social sciences collectively on major environmental problems. The PIK has been conceived as a flexible and innovative institute along the lines of a "think tank".

The 39 members of the Institute's staff have been temporarily housed in a building on the Telegrafenberg.

The PIK's work is concentrated on probably the most serious environmental problem of our time: a possible change in climate with all its consequences for human beings and their health, their natural world, as well as civilizatory systems, e.g. energy industry and transport. Not only the natural environment, but also economic structures are likely to be affected worldwide by climatic change. ❐

(BMFT-Journal)

Cooperation with Russia greatly advances arctic research

Hitherto inaccessible regions now being explored

Scientific cooperation between Russia and Germany has developed positively in many areas in the last few years. The 9th arctic voyage of the research vessel *Polarstern* since 26 February 1993 is also an expression of this good cooperation.

For the very first time, 60 German and Russian male and female researchers on board the *Polarstern* and the *Dalnie Zelentsy*, the Russian research ship, are carrying out joint scientific surveys in the area of Franz Josef Land, the eastern Barents Sea and in the Laptev Sea off Central Siberia. Thus research has become possible in regions of the Arctic which were completely inaccessible a few years back. The thematically very broad research programme plans to undertake oceanographic, biological, glaciological and geoscientific measurements and specimen analysis.

Current studies confirm that the Arctic is a major component in the earth's climatic system. Research vessel *Polarstern*. Photo: AWI

Current observations in the polar seas, findings from ice and sediment cores, and recent experiments with climatic models confirm that the Arctic is a major component of the earth's climatic system. Consequently, the Arctic has become the object of growing scientfic interest for research into global change.

Accordingly, the Alfred Wegener Institute of Polar and Marine Research (AWI), Bremerhaven, which receives 90 % of its funds from the Federal Ministry of Research and Technology (BMFT), has intensified its arctic research quite perceptibly in recent years. In 1992, it proved possible to create 10 additional posts for arctic research. Further posts are to be made available in 1993 and 1994.

The object of the increased arctic activities on the part of German research institutions, which are coordinated by the AWI, is to intensify relations with Russian colleagues – which, in some cases, have existed for years.

In this connection, the BMFT is providing funds for joint research projects within the framework of scientific-technological cooperation and also for the safeguarding of the existence of individual research groups in Russia. DM 25 million, for instance, are being devoted to bilateral research projects focussed on oceanographic and geological studies in the Arctic.

At the present time, the Alfred Wegener Institute is concentrating its efforts on three focal points which are connected with each other thematically, but being carried out in different regions of the Arctic: marine research in the Arctic Ocean, ice research in Greenland and atmospheric research in Spitzbergen. Using the only source of light available during the polar night in 1992/93, i.e. moonlight, researchers at Koldewey Station succeeded for the very first time in registering the distribution and concentration of 20 trace gases in the atmosphere. The station is linked up with a worldwide measuring network for the registration of changes in the earth's radiation balance and the chemical composition of the stratosphere.

All research projects by the Alfred Wegener Institute in the Arctic are part of worldwide efforts to investigate, monitor and, in the final analysis, forecast the causes of natural global and regional changes in the environment and the effects of those resulting from human action. ❐

(BMFT-Journal)

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Change of emphasis in German vocational training aid

Orientation towards specific requirements

In March 1992, the Federal Ministry of Economic Cooperation and Development put its new concept for vocational training aid into effect. This concept represents a departure from a single transferable model and, instead, opens up the possibilities of providing support at several levels – according to the development stage and requirements of a specific country.

For a long time, The "German" trade school, in which theoretical and practical vocational training took place under one roof, later the dual system, in which practical training was transferred to firms, was a product stamped "made in Germany". Even the "Concept for Development Cooperation in Occupational Training", dating from the year 1986, was heavily oriented towards the German dual system and only partly transferable to developing countries.

What is new about this concept?

The new concept is based on a modified fundamental approach. The priority promotion of the modern industrial sector, which, in the conventional view of Western modernization theories, is responsible for the success of a national economy, has failed to achieve the desired results in many developing countries.

The majority of persons living in these countries have no real opportunities of participating in the social and economic progress of their society. Consequently, the new concept is focussed on the "informal" sector, i.e. the life and survival area of these persons.

Several development theoreticians are considering only the small and smallest enterprises and merchants in the informal sector because they expect pan-economic impulses to come from this particular group. Their object is to bring these informal small and very small businesses into the modern economic sector. The new point of departure has broadened this view about persons who, in the foreseeable future, cannot be integrated into a modern economic and social structure with its own prevailing rules, norms and development prospects. By means of income-creating training and further training measures, better prospects must be opened up for these persons who, in many respects, are disadvantaged.

Objective

The point of departure for vocational training aid is the "vocational training system" which is actually practiced in the development country concerned. In most cases, it is not a case of a uniform, compact system, but of a number of widely varying forms of training and further training on the responsibility of the state, firms or private institutions. It ranges from the traditional training of semi-skilled persons and apprenticeships to state recognized professions requiring skilled training. In other words, appropriate strategies must be developed to improve existing vocationnal training opportunities and to make them more efficient. In order to achieve sustained results, recommended and practiced changes must meet with broad acceptance by those concerned and take the latters' capa-

In Peshawar, a centre of the processing industry in Pakistan, courses are provided for Afghan refugees and local Pakistanis. Photo: A. Krause

bilities and personal concepts into consideration. Instead of radically changing training systems which already exist, points of departure must be drawn up – together with the partner – which will not be too difficult to reconcile with these systems.

Experience gained in the last few decades has shown that the basic requirements for the promotion of dual training paths do not exist in many developing countries. Here, mistakes have been made in the past since the strength of what already exists in developing countries was underestimated and the persuasive power of the dual vocational training concept overestimated.

In principle, the basic conditions for dual training structures are only favourable if:

- the developing country has a broad economic structure of industry and skilled trades;
- association structures exist whose members are willing and able to assume responsibility within the dual vocational training system and provide young persons with on-the-job training;
- the existing state trade-training system is not dominated by vocational training firms providing training of a purely scholastic nature, and traditional apprenticeships exist which can be latched on to;
- the state is prepared to work hand in hand with the economy and, if needs be, surrender certain of its powers;
- trade unions with the right of codetermination are allowed.

Since such preconditions exist in very few developing countries, the new point of departure is deliberately not taking the dual trade-training system as the only model.

The principles which, in the German view, are closely linked with vocational training and consequently influence the thoughts of both the experts and the politicians, are:

- orientation of vocational training towards the requirements of the employment system (employed and self-employed);
- conveyance of practically applicable skills under genuine working conditions wherever possible;
- sharing of the financial burden between state and the economy;
- vocational training for broad areas of the population.

A DED development helper visiting a village school in Brazil where the teachers are being advised on the production of teaching materials.

Photo: DED/Uwe Rau

Implementation

The new concept describes for the first time the succession of steps which make possible the elaboration of a strategy for vocational training tailored to a particular country:

1. Sectoral analysis. In those cases where vocational training constitutes a focal point of cooperation, a broadly based sectoral analysis should be undertaken together with the partner initially. The study should not only embrace the formal, i.e. state-recognized, vocational training, but also "non-for-

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DED development helper at a training centre in Brazil.

Photo: DED/Uwe Rau

mal" training. In this context, the interlinking with the general education system and the coordinating mechanisms between the vocational training system, on the one hand, and the employment system, on the other, must be analyzed. The following questions must be asked, for example:

Do existing training opportunities prepare persons for a profession as an employed (dependent) or self-employed (independent) person? Is the training content of practical use in the daily struggle for existence? Is a long-term financing of the "system" possible and, if so, under what conditions? Where are the major shortages? The analysis must make a distinction between men and women in order to register the differing training and employment situations.

2. Vocational Training Policy. The partner institution in the developing country can use this analysis of the status quo and its shortages to formulate its national vocational training policy. At the same time, a dialogue among experts can take place to establish where and in what way German support is desired.

The first analyses, linked with a policy dialogue of a specifically sectoral nature, have already been completed in Papua New Guinea, Yemen, Chile, Indonesia and South Africa. In Yemen, for example, the vocational training system was spread over several ministries operating according to differing concepts. Encouraged by the successful cooperation practised in the education sector since 1976, the Yemen Education Ministry has asked the Federal Republic to assist in the setting up of a standardized and efficient vocational training system.

3. Points of departure for projects. Within the framework of an overall strategy, agreed with the partner, project points of departure must be selected and, wherever possible, combined:

- system development;
- training centres and programmes;
- training and further training of target groups from the informal sector;
- qualification of personnel and provision of teaching and learning materials;
- on-the-job training.

The new concept attaches particular value to support by the partner in system development. This, however, presupposes that German support is of a long-term nature. Apart from system advice at governmental level, simultaneous practical training and further training measures should be implemented wherever possible to illustrate, by means of an example, the recommended improvements in the training concept. Only practical evidence shows whether it has been genuinely adapted, and, consequently, if it can be further applied and financed.

A new feature in the Federal Ministry of Economic Cooperation and Development's concept is the marked emphasis of an integrated starting point for projects. The combination of vocational training aid with trade or business assistance, for example, or with urban district development measures or within the framework of regional development, promises a more sustained effect since, in this way, the economic and social and environment can be included and improved. Even in the case of classical projects – such as "The Setting Up a Training Centre" – steps must be taken to see if such a training centre can provide services – such as technical advice for businesses or for the local economy – and if needs be help cover the running costs through technical and commercial further training programmes.

Particularly with regard to the promotion of target groups in the informal sector, the basic question arises whether state authorites are suitable for these points of departure for projects or whether new agencies, with which state development cooperation has not worked before, should be sought and developed. The new concept provides no new patent recipe for this question. In particular cases, a sound analysis of possible responsible bodies must be undertaken beforehand. The fundamental criteria for the assessment are acceptance on the part of the target groups, the usefulness and applicability of the training, and the ability to react flexibly to a constantly changing environment. At the present time, pilot projects, which are designed to help develop the necessary process for analyzing responsible bodies, are being carried out in Laos and Zambia. ❐

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